REMARKS

Claims 1-53 and 59-108 are pending in the present application. Claims 54-58 and 109-113 have been cancelled without prejudice or disclaimer to the subject matter contained therein. The Applicant reserves the right to file a divisional application directed to the subject matter of cancelled claims 54-58 and 109-113.

Claims 74 and 75 have been amended to correct typographical errors.

Rejection under 35 U.S.C. §102(e)

Claims 1, 2, 4-16, 19-21, 23, 25-27, 29-34, 37, 39-42, 59-73, 76-78, 81-89, 92, 94-97, 99, and 101 have been rejected under 35 U.S.C. §102(b) as being anticipated by McCaffrey (US Patent Number 6,101,294). This rejection under 35 U.S.C. §102(e) is respectfully traversed.

Independent Claim 1

As set forth above, independent claim 1 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels; determines an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; determines a transfer control function based on the determined illumination intensity level mapping function; and imposes the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 1.

Independent Claim 26

As set forth above, independent claim 26 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a plurality of numbers of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels; determines a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels; determines a transfer control function based on the plurality of determined illumination intensity level mapping functions; and imposes the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 26.

Independent Claim 37

As set forth above, independent claim 37 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of saturated pixels; selects a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold; determines a number of pixels having illumination intensity levels within a defined range of values; selects a second illumination intensity level mapping function when the determined number of pixels is below a second threshold; determines a transfer control function based on the selected illumination intensity level mapping function; and imposes the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the

charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 37.

Independent Claim 41

As set forth above, independent claim 41 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method determines a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value; determines an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; determines a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level; determines an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels; determines a transfer control function based on the determined illumination intensity level mapping function and the determined integration time; and imposes the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the

charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 47.

Independent Claim 59

As set forth above, independent claim 59 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 59.

Independent Claim 82

As set forth above, independent claim 82 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a plurality of number of pixels, each determined number of pixels being a number of pixels within an associated defined range of illumination intensity levels and to determine a plurality of illumination intensity level mapping functions, each determined illumination intensity level mapping function corresponding to one defined range of illumination intensity levels, each illumination intensity level mapping function being determined based upon the determined number of pixels within an associated defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the plurality of determined illumination intensity level mapping functions and to impose the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 82.

Independent Claim 92

As set forth above, independent claim 92 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to determine a number of saturated pixels and to select a first illumination intensity level mapping function when the determined number of saturated pixels is above a first threshold, the illumination intensity level mapping controller determining an number of pixels having illumination intensity levels within a defined range of values and selecting a second illumination intensity level mapping function when the determined number of pixels is below a second threshold; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a transfer control function based on the selected illumination intensity level mapping function and to impose the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 92.

Independent Claim 96

As set forth above, independent claim 96 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination

intensity level mapping controller, operatively connected to the digital imager, to determine a number of pixels of image data having illumination intensity levels within a first defined range of illumination intensity levels, the first defined range of illumination intensity levels including an illumination intensity level corresponding to a pixel saturation value, and to determine an illumination intensity level mapping function based upon the determined number of pixels within the first defined range of illumination intensity levels; an exposure controller, operatively connected to the digital imager, to determine a number of pixels having illumination intensity levels within a second defined range of illumination intensity levels, the second defined range of illumination intensity levels including an illumination intensity level corresponding to a minimum illumination intensity level, and to determine an integration time based upon the determined number of pixels having illumination intensity levels within the second defined range of illumination intensity levels; and a transfer control function generation circuit, operatively connected to the digital imager, the exposure controller and the illumination intensity level mapping controller, to determine a transfer control function based on the determined illumination intensity level mapping function and the determined integration time and to impose the determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Therefore, McCaffrey fails to anticipate the presently claimed invention, as set forth by independent claim 96.

Dependent Claims

With respect to dependent claims 2, 4-16, 19-21, 23, 25, 27, 29-34, 39-40, 42, 58, 70-73, 76-78, 80-81, 83-89, 94-95, 97, 99, and 101 the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 1, 26, 37, 59, 82, 92, and 96. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §102(e).

Rejection under 35 U.S.C. §103 over Gough in view of Fossum et al.

Claims 3, 22, 28, 43-47, 79, 98, 100, and 102 have been rejected under 35 U.S.C. §103 as being unpatentable over McCaffrey et al. (US Patent Number 6,101,294). This rejection under 35 U.S.C. §103 is respectfully traversed.

With respect to dependent claims 3, 22, 24, 28, 43-47, 79, 98, 100, and 102, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 1, 26, 37, 41, 59, 82, 92, and 96. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Rejection under 35 U.S.C. §103 over Gough in view of Gallagher et al.

Claims 38, 52, 53, 93, 107, and 108 have been rejected under 35 U.S.C. §103 as being unpatentable over McCaffrey et al. (US Patent Number 6,101,294) in view of Gallagher et al. (US Patent Number 6,765,611). This rejection under 35 U.S.C. §103 is respectfully traversed.

Independent Claim 52

As set forth above, independent claim 52 recites a method of adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The method selects a first illumination

intensity level mapping function; determines a first transfer control function based on the selected first compression; imposes the determined first transfer control function upon a pixel of the digital imager; determines a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon; determines an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram; determines a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager; determines a second transfer control function based on the determined second illumination intensity level mapping function; and imposes the determined second transfer control function upon a pixel of the digital imager.

As previously established, McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Moreover, Gallagher et al. fails to disclose or suggest determining a transfer control function based on the determined illumination intensity level mapping function.

In summary, both McCaffrey and Gallagher et al., singly or in combination, fail to disclose or suggest determining a first transfer control function based on the selected first

compression and/or determining a second transfer control function based on the determined second illumination intensity level mapping function, as set forth by independent claim 52.

Therefore, the proposed combination of Gough in view of Gallagher et al. fails to render the presently claimed invention obvious to one of ordinary skill in the art.

Independent Claim 107

As set forth above, independent claim 107 recites a system for adaptively controlling sensitivity, on a pixel-by-pixel basis, of a digital imager. The system comprises an illumination intensity level mapping controller, operatively connected to the digital imager, to select a first illumination intensity level mapping function; and a transfer control function generation circuit, operatively connected to the digital imager and the illumination intensity level mapping controller, to determine a first transfer control function based on the selected first compression and to impose the determined first transfer control function upon a pixel of the digital imager.

The illumination intensity level mapping controller determines a histogram of illumination intensity levels of pixels of image data being generated by the digital imager having the determined first transfer control function imposed thereon.

The illumination intensity level mapping controller determines an illumination intensity level maximum, the illumination intensity level maximum representing a greatest illumination intensity level for a pixel in a sample forming the histogram.

The illumination intensity level mapping controller determines a second illumination intensity level mapping function, based on the determined intensity level maximum, the second illumination intensity level mapping function preventing the generation of any saturated pixels and providing a dynamic range of image data enabling each level in the histogram to be realized by the digital imager.

The transfer control function generation circuit determines a second transfer control function based on the determined second illumination intensity level mapping function.

The transfer control function generation circuit imposes the second determined transfer control function upon a pixel of the digital imager.

McCaffrey discloses varying the charge capacity control voltage to change the charge capacity of the imager over the integration period. More specifically, McCaffrey discloses that

charge capacity control voltage is stepped up to an intermediate level during the integration period and then up to the maximum level towards the end of the integration period.

In contrast, the present invention determines a transfer control function. As defined in the specification, the transfer control function is a control voltage that controls the integration time of the pixel wherein the integration time is the period of time the control voltage is not at the reset value for the pixel.

McCaffrey fails to disclose determining a transfer control function based on the determined illumination intensity level mapping function because McCaffrey teaches varying the charge capacity control voltage to change the charge capacity of the imager over the integration period.

Moreover, Gallagher et al. fails to disclose or suggest determining a transfer control function based on the determined illumination intensity level mapping function.

In summary, both McCaffrey and Gallagher et al., singly or in combination, fail to disclose or suggest determining a first transfer control function based on the selected first compression and/or determining a second transfer control function based on the determined second illumination intensity level mapping function, as set forth by independent claim 107.

Dependent Claims

With respect to dependent claims 38, 53, 93, and 108, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 37, 52, 92, and 107. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Rejection under 35 U.S.C. §103 of claims 48-51 and 103-106

With respect to dependent claims 48-51 and 103-106, the Applicant, for the sake of brevity, will not address the reasons supporting patentability for these individual dependent claims, as these claims depend directly or indirectly from allowable independent claims 41 and 96. The Applicant reserves the right to address the patentability of these dependent claims at a later time, should it be necessary.

Accordingly, in view of the remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw the rejection under 35 U.S.C. §103.

Conclusion

Accordingly, in view of all the reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw the present rejections. Also, an early indication of allowability is earnestly solicited.

Respectfully submitted,

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